ATTACHMENT A

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Comsearch Technical Appendix

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Subject: MSS ATC System Questions

1. From a technical perspective, can MSS be severed from terrestrial operations?

Yes. Satellite and terrestrial operations can be severed so that two providers can provide both services. In fact, the technical showings supplied by the MSS industry demonstrate that satellite services, in the same geographic area, do not share the same spectrum band. Therefore, from a technical perspective, the proposal for ATC appears to contemplate band segmentation or "severing." Additionally, technically, a hybrid satellite/terrestrial service that provides urban area and in-building coverage as well as ubiquitous satellite coverage could be designed. Technically, it does appear that a terrestrial component operating within the same band, but not the exact same spectrum, as the Mobile Satellite component could be designed. In this technical appendix, we examine some of the interference issues which might exist if the terrestrial component were severed from the MSS component.

The interference calculations for the Forward band mode have been examined for both cdma2000 and UMTS and the results are shown in the attached spreadsheets. The main thing that appears to be obvious from looking at the interference calculations is that the Mobile terminal should not operate in the Space Component mode when in the presence of an ATC base. This means that, in general, the ATC system proposed will heavily favor the use of the terrestrial network over the satellite network when both systems are present. Interference analyses for the above statement are described in the attached spreadsheets as Scenarios 1 and 4 respectively. The analysis clearly shows that, regardless of which air interface is used, ATC and SC cannot operate co-frequency within the same cell, and therefore that band segmentation or severing is already contemplated. A brief summary is provided below:

Cdma2000 Terrestrial System and the ICO MSS Interference

Scenario 1 involves interference from the mobile unit in SC mode into the ATC base receiving from a mobile in ATC mode. The results indicate that the mobile unit cannot talk to

the satellite using the same frequency as the receiver at the ATC unless a lot of blockage exists between it and the base station.

Scenario 2 involves interference from the satellite downlink into a mobile unit receiving from the ATC base station. The results show that a single carrier satellite downlink does appear to cause interference into ATC mobile receivers.

Scenario 3 involves interference from the mobile terminal interfering into the satellite receiver. The results indicate that a single ATC Mobile does not appear to interfere with the satellite.

Scenario 4 involves interference from the ATC base station into the mobile receiving in SC mode. The results show that the ATC base must be very far away or well shielded from SC Mobile to not cause interference.

UMTS Terrestrial System and the ICO MSS Interference

An interference analysis was performed using the ICO MSS and UMTS provided specs. The specifications are detailed on page 1 of the attached spreadsheet. The results of the forward band interference analysis are similar to the results for the ATC. The mobile in SC mode will interfere with the UMTS base stations and the UMTS base station will interfere with the mobile receiving in SC mode.

Scenario 1 involves interference from the mobile unit in SC mode into the UMTS base receiving from a mobile in UMTS mode. The results indicate that the mobile unit cannot talk to the satellite using the same frequency as the receiver at the ATC unless a lot of blockage exists between it and the base station.

Scenario 2 involves interference from the satellite downlink into a mobile unit receiving from the UMTS base station. The results show that a single carrier satellite downlink does not appear to cause interference into UMTS mobile receivers.

Scenario 3 involves interference from the mobile terminal interfering into the satellite receiver. The results indicate that a single UMTS Mobile does not appear to interfere with the satellite.

Scenario 4 involves interference from the UMTS base station into the mobile receiving in SC mode. The results show that the UMTS base must be very far away or well shielded from SC Mobile to not cause interference.

If, for example, an ATC cdma2000 system were lightly loaded then only one channel will be in operation in the area. In order to effectively use both the SC and the ATC, non-overlapping spectrum would be required. If the ATC cdma2000 system were highly loaded then multiple channels may be in use. If the SC is operating in spectrum used by an adjacent cell, it is still not entirely clear that the SC would not interfere even with adjacent cells.

In order to share the spectrum, there needs to be sufficient geographic separation between co-channel users and a sophisticated interference mitigation and switching scheme must be utilized. In this case, the terrestrial system would seem to be the only way to make a call in a building or in an urban environment. Over time, it appears that the terrestrial component would dominate the areas where most of the customers are. The band could be segmented and allow for two separate providers for the satellite and terrestrial components. In fact these types of hybrid phones are currently in operation. For instance, this service can be purchased from Globalstar today.

2. Is it technically feasible for one operator to provide terrestrial services and another operator to provide satellite services in the same MSS band?

Yes. From a technical standpoint this could be done. If the band were segmented between the satellite and terrestrial operations then this would be feasible. In order for the services to work effectively together, the satellite and terrestrial operators would be required to cooperate on issues of interference mitigation. Although there may be some benefits to dynamically allocating spectrum between satellite and terrestrial users in terms of spectral efficiency, independent contractors could also achieve such benefits through partnerships with satellite operators.

The interference analyses seem to indicate, however, that the best way to use the spectrum in an urban environment would be to use the terrestrial component only and avoid using the satellite component, suggesting that band segmentation is already contemplated in an ATC environment.

3. How would severing the operations affect domestic and foreign satellite operations? terrestrial operations?

As indicated above in question two, MSS and terrestrial operators would have to work cooperatively to ensure interference was mitigated to international operations. However, this would not be any more difficult, technically, than the requirements for a provider of ATC services to alleviate interference to international operations.

4. How would severing the operations affect service to remote and rural areas? to urban areas?

Since most MSS systems provide global (or near global) coverage, the satellite service will exist in both remote and rural areas. However, although the satellite signal would also radiate into urban areas, in order to effectively provide service, ATC would have to be provided in order to ensure adequate signal quality in all urban environments, particularly for in-building coverage. Regardless of whether terrestrial service is provided as an ATC or a separate terrestrial service by an alternative provider, urban markets will require extensive terrestrial

networks to be deployed to guarantee seamless coverage. Severing operations would have no effect, technically, on service to rural, remote, or urban areas.

5. How would the technical requirements for separate services differ from the technical requirements for integrated MSS ATC?

This is a very complicated question, but in general whether a terrestrial provider or satellite provider provides terrestrial service, the technical requirements for the air interface, such as interference issues, power, channel plan, noise thresholds, and other parameters would be the same. In-band MSS and out-of-band licensees (like Fixed Services, PCS, and BAS) would need to be protected. The intraband interference issues involved with an MSS system using ATC are similar to those that would be present if the terrestrial component were separated.

6. How would severing the operations affect adjacent channel operations (both satellite and terrestrial)?

As noted in the response to question five above, all interference issues would still require attention, regardless of whether the terrestrial service was provided by ATC or an independent provider. The only major difference would be that the interference would be inter-system in the case of an independent provider, rather than intra-system, as would be the case with ATC.

7. What requirements are necessary for an integrated MSS ATC system to avoid adjacent channel and/or adjacent band interference?

Again, as noted in question five above, these issues would be the same for any terrestrial system.

8. How do the technical requirements that integrated MSS ATC systems must observe to avoid creating harmful interference differ from those that freestanding terrestrial mobile systems would have to observe?

Once again, as noted in question five above, there is no difference.

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